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INDUSTRIAL RELEASE LIMITS POLICY

Alberta
ENVIRONMENT

November 2000

Environmental Sciences Division
Environmental Services

Pub. No: T/569
ISBN: 0-7785-1410-2 **Printed Edition**
ESBN: 0-778501411-0 **On-line Edition**
A copy of the document may be viewed and downloaded by using the "Search Alberta Environment" feature on the Department's Web Site: http://www.gov.ab.ca/env/

Any questions or clarifications regarding the *Industrial Release Limits Policy* document may be directed to:

Environmental Sciences Division
Alberta Environment
4th Floor, Oxbridge Place
9820 – 106 Street
Edmonton, Alberta, T5K 2J6
Phone: (780) 427-5883
Fax: (780) 422-4192
Email: environmental.science@gov.ab.ca

Additional copies of this document may be obtained by contacting:

Information Centre
Alberta Environment
Main Floor, Great West Life Building
Main Floor, Great West Life Building
9920 – 108th Street
Edmonton, Alberta T5K 2M4
Phone: (780) 944-0313
Fax: (780) 427-4407
Email: env.infocent@gov.ab.ca

Summary

This policy document outlines the approach followed by Alberta Environment (AENV) staff to develop industrial release limits for approvals under the *Environmental Protection and Enhancement Act*. The policy supports the Alberta Government's "Commitment to Sustainable Resource & Environmental Management" by outlining how pollution prevention/control requirements are established for industrial releases to the environment.

Industrial release limits are intended:

- **to protect the ambient environment and human health,**
- **to ensure the most appropriate pollution prevention and control technologies are adopted, and**
- **to seek continuous improvement.**

The approach to setting industrial release limits is based on the following principles:

Principle 1: Industrial release limits will be established based on limits achievable using the most effective demonstrated pollution prevention/control technologies or the limits required to meet risk based and scientifically defensible ambient environmental quality guidelines, whichever are the more stringent. (Note: advanced technology limits may be adopted in lieu of ambient limits in certain circumstances).

Principle 2: When developing a technology based release limit, AENV will consider any relevant sector-specific technology based limits from other jurisdictions. A sector-specific limit relies on the use of the most effective demonstrated pollution prevention/control technologies. This type of limit is applied uniformly across an industrial sector. In general, AENV sector-specific technology based limits will be amongst the most stringent when compared with those in other jurisdictions.

Principle 3 When developing a technology based release limit for which no relevant sector-specific limit exists, AENV will consider case-specific technology based limits. This type of limit is based on a review of an individual plant's existing performance, or the performance of similar facilities anywhere in the world. The capabilities of the control technologies that are relevant to the facility will be assessed.

Principle 4 AENV will develop ambient environmental quality limits based on a site specific assessment of release limits required to meet ambient guidelines and using procedures outlined in the respective reference documents. This assessment will include consideration of cumulative effects.

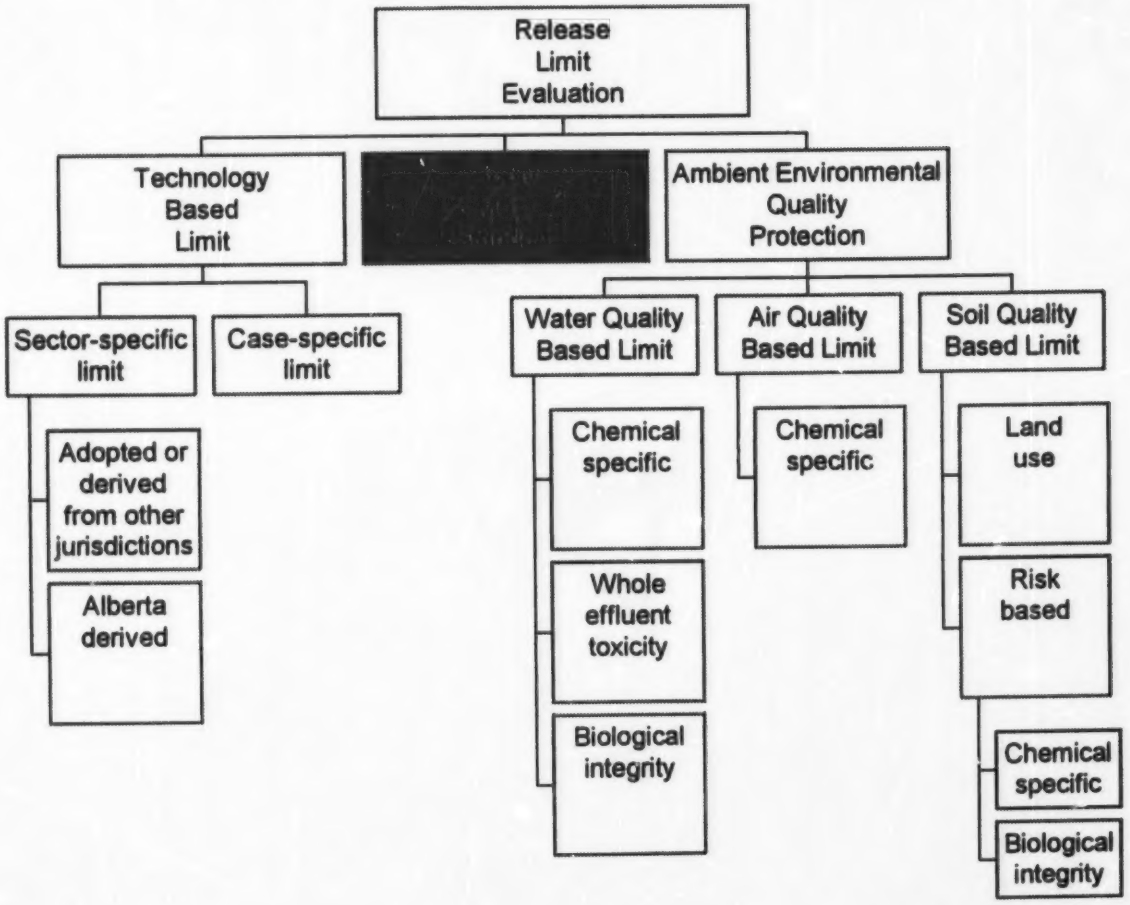
Introduction

The intent of this policy is to provide an overview of the principles and procedures used by Alberta Environment staff when developing industrial release limits. These limits are required to ensure that

- ***the environment and human health are protected,***
- ***the most appropriate pollution prevention and control technologies are adopted, and***
- ***continuous improvement is sought.***

To determine whether the appropriate level of pollution prevention and control technologies are adopted and to ensure that the environment is protected requires two parallel assessments. These involve determining the release limits required to maintain ambient air, water, and soil quality, and secondly, determining the achievable release limits based on the capability of the most effective demonstrated pollution prevention and control technologies. The results of these two investigations are compared and the more stringent result is applied as the release limit. This approach is summarized in Figure 1. The policy is based on a number of technical sources listed in the reference section of this document.

Figure 1: Alberta's Approach for Setting Industrial Release Limits



What are technology limits?

Technology limits are release limits, that when applied, require the use of the most effective demonstrated pollution prevention and control technologies. The limits also establish a level playing field among similar industrial facilities.

A common approach to develop technology limits is to adopt Environment Canada, United States Environmental Protection Agency (USEPA), or Canadian Council of Ministers of the Environment (CCME) technology limits where they exist and are applicable. However, **sector-specific technology**[1] limits may also be developed in Alberta where a sufficient number of similar facilities exist.

Sector-specific technology limits:

- are at the point of release; they do not describe specific technologies except by way of describing the basis for the limit (i.e. are performance based);
- represent some upper percentile of industry performance as a whole (i.e. are stringent);
- are established by considering a wide enough industrial base that their imposition does not result in an economic advantage/disadvantage in the marketplace (i.e. are demonstrated/practical);
- recognize varying economic capabilities associated with the age and type of facility (e.g. subsectors within sectors); and
- are periodically reviewed to keep pace with advancing technology (i.e. incorporate continuous improvement).

The general steps required to develop a sector-specific technology limit include the following:

- perform a literature search to obtain the latest information on treatment processes and in-plant pollution prevention technologies;
- identify significant pollutants and their effects;
- converse with other environmental regulators about their experience pertaining to the industry;
- review regulatory requirements and limits in other jurisdictions;
- conduct industrial plant surveys to collect statistical data on operations;
- conduct site visits, sampling and evaluation of selected industrial sites;
- solicit comment and participation from industrial representatives and the public at large; and
- conduct an economic analysis of the impact of the identified treatment technology on the industry.

[1] Also known as categorical technology limits

If it is found that the facility cannot be adequately classified within a sector, case-specific technology limits must be developed. Case-specific limits are normally developed for a single facility by considering:

- the appropriate technology for similar facilities, based upon all available information;
- any unique factors relating to the facility; and
- the same considerations used in developing a sector-specific technology limit.

Some references and tools that may be consulted on case-specific limits are:

- the US EPA Treatability Manuals (5 volumes);
- abstracts of Industrial National Pollutant Discharge Elimination System (NPDES) Permits;
- literature searches; and
- an engineering analysis by the applicant.

AENV is committed to the principles of pollution prevention and continuous improvement. These principles will be reflected in stringent technology based limits. Where there are no ambient environmental constraints, limits based on the use of the most effective demonstrated pollution prevention and control will help to minimize the release of pollutants to the environment and keep "clean areas clean".

What are ambient environmental quality based limits?

Ambient Environmental Quality limits are developed based on protection of the ambient air, water, or soil receiving the effluent. These types of limits are derived by calculating how much of a given pollutant can be released under normal source operations and worst case environmental conditions, while still meeting ambient air, water, and soil quality guidelines. Water quality based limits protect the receiving stream and soil quality (land application). Air quality based limits protect the surrounding airshed (as specified in the *Alberta Ambient Air Quality Guidelines*) and soil quality (deposition). Soil quality based release limits are intended to protect a variety of land uses and are also used to guide clean-up efforts when accidental releases to soil occur.

The air, water, and soil quality guidelines used by AENV will be scientifically based and protective of human health and ecosystems. **Chemical-specific, whole effluent toxicity, biological assessment techniques, dispersion modelling, and ground level concentrations** are used to set limits that maximize ecological protection.

Principles for setting industrial release limits

The following principles describe how technology and ambient environmental quality requirements are used in the establishment of release limits. Principle 1 outlines the approach used to determine which type of release limit applies and under what circumstances. Principle 2 and Principle 3 outline the criteria applied in developing sector-specific and case-specific technology limits. Principle 4 outlines the ambient environmental quality based approach and its associated components.

Principle 1: *Industrial release limits will be established based on limits achievable using the most effective demonstrated pollution prevention/control technologies or the limits required to meet ambient environmental quality guidelines, whichever are the more stringent. (Note: advanced technology limits may be adopted in lieu of ambient limits in certain circumstances).*

Technology limits define the minimum acceptable limits for industrial facilities. Where ambient constraints dictate, ambient environmental quality limits may supersede technology based limits. The only exception is when an environmental quality based limit is not technically attainable. In such cases an advanced technology limit may be adopted as an interim limit.

Principle 2: *When developing a technology based release limit, AENV will consider any relevant sector-specific technology based limits from other jurisdictions. A sector-specific limit relies on the use of the most effective demonstrated pollution prevention/control technologies. This type of limit is applied uniformly across an industrial sector. In general, AENV sector-specific technology based limits will be amongst the most stringent when compared with those in other jurisdictions.*

Sector-specific technology limits[2] form the minimum restrictions for industrial releases. There are two types of sector-specific technology limits:

1. Sector-specific limits that have been developed in Alberta. An example of a water release limit applied to pulp mills is fish toxicity (50% or greater survival of trout over 96 hours in undiluted effluent). An air release limit example is the sulphur recovery guidelines for sour gas plants in Alberta.

2. Sector-specific limits that are adopted from other jurisdictions. The procedure followed when inter-jurisdictional sector-specific limits are used, such as the US EPA or CCME guidelines, is to classify the industrial facility and then calculate the release limits.

AENV is committed to the development or adoption of sector specific limits that are stringent and provide a high degree of environmental and human health protection.

[2] Also known as categorical technology limits

Principle 3: *When developing a technology based release limit for which no relevant sector-specific limit exists, AENV will consider case-specific technology based limits. This type of limit is based on a review of an individual plant's existing performance, or the performance of similar facilities anywhere in the world. The capabilities of the control technologies that are relevant to the facility will be assessed.*

Case-specific technology limits are generally based on technology and are used when sector-specific technology limits do not exist. The issues considered in formulating case-specific limits are similar to those associated with sector-specific limits, except the procedure is normally applied to a single facility.

The development of case-specific technology limits is necessary under the following circumstances:

- sector-specific technology limits are not available for the facility;
- the facility has sector-specific technology limits but emits substances that are not covered by those limits;
- sector-specific technology limits may exist, but the industrial processes have changed or are of a different nature and the substances produced are no longer accurately described by the existing limits; and
- either sector-specific technology or ambient environmental quality based limits must ultimately be applied, but the facility must meet them over some time frame. Case-specific limits[3] may then be applied on a scheduled basis.

Principle 4: *AENV will develop ambient environmental quality limits based on a site specific assessment of release limits required to meet ambient guidelines and using procedures outlined in the respective reference documents. This assessment will include consideration of cumulative effects.*

- For water, these limits are developed using the procedure outlined in the *Water Quality Based Effluent Limits Procedures Manual*.
- For air, the limits are often developed utilizing dispersion modelling techniques, under the assumption of worst case conditions, to determine acceptable emission limits to meet the *Alberta Ambient Air Quality Guidelines* or some other point of impingement standards.
- For soil, the limits are based on the ability of soil to assimilate the effluent without a permanent increase in ambient levels. Exceptions may be granted when an increase is balanced by an overriding benefit.

Alternatively, more sophisticated modelling approaches may be employed that more precisely reflects the desired frequency or compliance of the released substance with ambient guidelines at a specific location.

[3] The limits assigned under this scenario may also be referred to as "interim" sector-specific technology or water quality based limits.

Media-specific considerations in setting limits

AIR

Ambient Air Quality Guidelines

The *Alberta Ambient Air Quality Guidelines* form a part of the Alberta air quality management system. Components of the system relevant to air release limits are plume dispersion modelling, and ambient and source emission monitoring. This system was designed to ensure that air emissions are minimized through the use of demonstrated technology and that residual emissions are dispersed so that guideline values are not exceeded. Guideline values are used in setting release limits for industrial facilities.

Interim Ambient Air Quality Based Limit

Situations may arise when ambient air quality based discharge limits can not be met for existing facilities, even with the most advanced control technology. Three alternatives may then be considered: a site-specific consideration of the applicable ambient air quality guidelines, a scheduled implementation of the ambient air quality based limits over some reasonable timeframe, or approval for operation of the facility may be denied until the air quality issue can be addressed. The final decision will be directly related to the degree of environmental impact observed or predicted.

WATER

Water Quality Guidelines

The *Surface Water Quality Guidelines for Use in Alberta* (AENV 1999), are used in developing water quality based limits. Limits are derived based on guideline values and are established to protect aquatic organisms from acute or chronic lethality. More information on the procedures for developing water quality based limits can be obtained from the *Water Quality Based Effluent Limits Procedures Manual.*

Mixing Zones

Water quality based limits may also provide for limited zones for dilution of the effluent plume where substances may exceed instream guidelines. These "mixing zones" are established in a manner which restricts the duration of exposure to organisms passing through the effluent plume, and considers other basin uses (e.g. recreation, potable water).

Chemical Specific and Whole Effluent Toxicity

Limits that are based on meeting instream guidelines are either developed through *"chemical specific"* or *"whole effluent toxicity"* approaches. The *chemical specific* approach involves restricting individual substance concentration to meet associated instream guidelines, while the *whole effluent* approach involves restricting the toxicity of an entire effluent to the extent that no toxicity will occur

instream. The *whole effluent* approach considers the aggregate effect of a complex mixture of substances. *Chemical specific* and *whole effluent* limits can be calculated based on projected stream and effluent flows and substance concentrations.

Biological Component

A third component to water quality based limits is the *"biological"* approach. The *biological* approach is more commonly associated with actual monitoring of the receiving stream to gauge and confirm the appropriateness of the existing limits. For example, benthic invertebrate monitoring upstream and downstream of the effluent release is done to assess the extent and acceptability of impact. Should the impact be judged unacceptable, in spite of instream guidelines otherwise being achieved, the effluent limits will have to be more stringent.

Interim Water Quality Based Limit

Situations may arise when water quality based discharge limits cannot be met for existing facilities, even with the most advanced wastewater technology. Three alternatives may then be considered: a site-specific consideration of the applicable ambient guidelines[4], a scheduled implementation of the water quality based limits over some reasonable timeframe, or approval for operation of the facility may be denied until the water quality issue can be addressed. The final decision will be directly related to the degree of environmental impact observed or predicted.

Procedures for Developing Water Quality Based Effluent Limits

The *Water Quality Based Effluent Limits Procedures Manual* discusses the details of setting these types of limits. It outlines the type of instream guidelines to be used, the approaches to determine the need for a water quality based limit, how to develop a wasteload allocation, and the subsequent calculation of limits from the wasteload allocation.

SOIL

Ambient Soil Quality Guidelines

Ambient soil quality guidelines are developed in accordance with *A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines* (CCME 1996a). This protocol addresses both human health and ecological protection under four different land uses: agricultural, residential/parkland, commercial, and industrial. Some modification of the guideline is allowed as described in *Guidance Manual for Developing Site-Specific Soil Quality Remediation Objectives for Contaminated Sites in Canada* (CCME 1996b).

Because soil quality guidelines are developed for particular uses of land, and less sensitive uses have higher guideline values, properties with contaminant levels that meet a particular land-use guideline cannot be converted to more sensitive uses without remediation. In order to keep clean areas clean and preserve land

[4] This site-specific assessment may also consider any mixing zone restrictions.

use options, contaminant-loading rates for land application of wastes on commercial/industrial lands must be managed with care so not to consume the entire guideline concentration.

Alberta Environment expects industrial operators to manage operations to prevent/minimize substance release to soil. Alberta Tier I criteria (AENV 1994) were developed to protect against effects regardless of land use. For areas that are currently uncontaminated, the minimum standards will be determined by Alberta Tier I criteria or equivalent objectives.

Land Application

Because contaminants tend to be retained by soil, rather than dispersed by the action of water currents or wind, release of effluents or wastes to land in a manner that causes soil contaminant concentrations to increase is not acceptable. Exceptions to this may be granted if the proponent can show an overriding benefit. In such cases, loading rates of the effluent or waste must be managed to prevent exceedances of soil quality guidelines.

Land treatment of biodegradable substances is one example of an overriding benefit where the soil's biological potential is used to degrade organic contaminants to a level that will meet the guidelines within an acceptable time frame. Another example is the use of sewage sludge and compost to improve soil fertility while managing co-contaminants within soil quality guidelines.

Conclusion

This policy document details Alberta Environment's approach to setting industrial release limits. The key principles of the policy are based on pollution prevention, continuous improvement, application of the most effective demonstrated pollution control technology, and the use of science based ambient environmental quality guidelines to ensure release limits protect the environment and human health.

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